

Large Bodies of Water Affecting Temperature Patterns

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1/30/2026

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Abstract

How does distance from a large body of water affect an area's air temperature patterns?

As global warming continues to intensify it is important for scientists to recognize temperature patterns and know where certain organisms thrive. Large bodies of water absorb heat from the air during the day and release it at night. My hypothesis is that if an area is closer to a large body of water then the area's temperature will change much more over the course of a day than an area further away because the water will absorb heat during the day and release it at night. First, locations were mapped out in different proximity to Lake Erie, Maumee Bay State Park on the shore of the Lake (0 mi), Curtice, OH at 5 miles from the shore, Woodland Forest, OH at 10 mi, Luckey, OH at 15 mi, New Rochester, OH at 20 mi and lastly, Cygnet OH, at 30 miles from shore. At each location a temperature reading was taken 3 times per day, once between 7 and 8 AM, once between 12 and 1 PM and once between 7 and 8 PM. 2 trials of this experiment were conducted and the data was averaged together into one data set. to compare the different location temperature patterns to each other. My hypothesis was not supported by my data because there was no significant difference between the area's distance from Lake Erie and temperature changes throughout the day.

Introduction

Air temperature is influenced by many environmental factors such as, sunlight, wind, elevation, and its distance from a major body of water. Water heats up and cools down slower than land and air making these water sources slowly affect air temperature during a given day. On hot, sunny days, water absorbs heat and keeps the air around it cooler and at night releases the heat, keeping the nearby air warmer as the water transfers its heat to the air. This effect is called temperature moderation and is why areas closer to large bodies of water experience larger temperature changes throughout the day than those far from water. Understanding how temperature is affected by an area's distance to a large body of water is important because it impacts an area's local climate, ecosystems, and agriculture.

Out of several locations at different distances from a major water source, my hypothesis for this experiment is that areas closer to the water will have larger but more gradual temperature changes throughout a given day. This happens because the nearby water absorbs heat when air temperatures rise and releases heat when temperatures drop. This question can be answered by testing air temperatures in different proximities to a large body of water like Lake Erie. I will use the same thermometer for each measurement and make sure I am testing the temperature at the same time of day for the most accurate results. I will complete multiple trials over different weeks in order to rule out any inclement weather days. I can then compare my data and look at

how temperature patterns are different from each other in relation to their distance from a major water source.

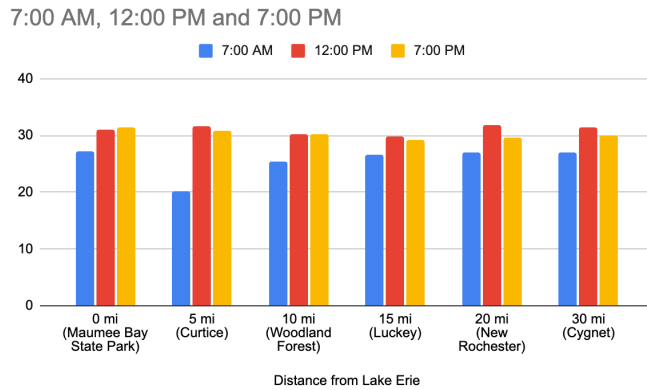
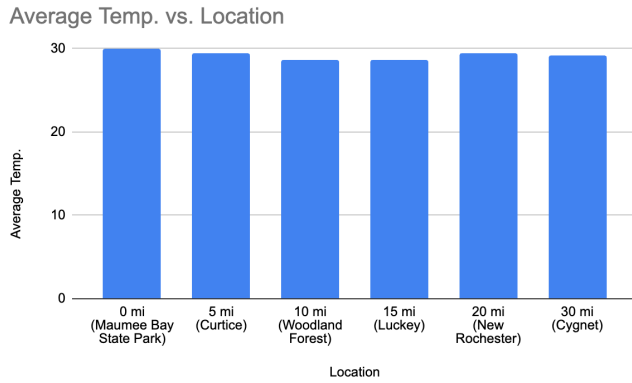
This experiment demonstrates how major water sources play a role in air temperature changes in tropical vs desert environments. By comparing temperatures at different distances from water, we can find that water helps reduce extreme temperature changes and creates a more stable climate in nearby areas. This is important for ecosystems, since many plants and animals depend on specific temperature ranges to survive. It also affects human activities such as farming and city planning. The experiment shows how natural geographic features influence weather patterns and highlights the importance of water in shaping climate conditions in different regions.

Methods and Materials

I acquired a scientific air temperature thermometer for quick readings of atmospheric temperature. I researched areas near me at different distances from Lake Erie and determined that I would collect data at areas in Five Mile increments from the shore of Lake Erie from 0 miles to 30 miles from the shore. I collected data three times per day at each location once between 7:00 p.m. and 8:00 a.m. once between 12:00 p.m. and 1:00 p.m. and once between 7:00 p.m. and 8:00 p.m. This ensured I could get a morning reading, a midday reading and a night time reading to get the best look at daily temperature patterns. I repeated these steps to get a total of two data sets to compare to each other and look for any outliers. Once my data was collected I created two bar charts, to do this I found the average temperature at each time and place and made a new data table to create the bar chart. The first bar chart consisted of three bars at each given area each

representing a different time. For my second bar chart I found the average overall temperature at each location to compare temperatures between locations.

Presentation of Data and Results



| Distance from Lake Erie | 7:00 AM | 12:00 PM | 7:00 PM |
|------------------------------|---------|----------|---------|
| 0 mi (Maumee Bay State Park) | 27.25 | 31.1 | 31.5 |
| 5 mi | 20.2 | 31.55 | 30.85 |

| Distance from Lake Erie | 7:00 AM | 12:00 PM | 7:00 PM |
|-------------------------|---------|----------|---------|
| (Curtice) | | | |
| 10 mi (Woodland Forest) | 25.3 | 30.2 | 30.3 |
| 15 mi (Luckey) | 26.7 | 29.9 | 29.3 |
| 20 mi (New Rochester) | 27 | 31.8 | 29.65 |
| 30 mi (Cygnet) | 26.95 | 31.5 | 29.95 |

My data showed me that on average, when an area is closer to a large body of water like Lake Erie the average temperature throughout the day will be higher than one further from the water. As the areas I was testing got towards 20 and 30 miles from shore the average temperatures throughout the day began to increase again this is likely because the area being tested was far enough away from the lake that it was not affected by its heat released and absorbed. Other factors like sunlight clouds precipitation or winds could have caused these temperatures to increase again. My data also showed me that there was not much of a difference in temperature changes throughout the day compared to how far the tested area was away from the lake. One outlier that can be found in my data is at 5 miles from Shore when all other distances temperature changes remain stable throughout the day. At five miles there is a huge jump in temperature from 7:00 a.m. to 12:00 p.m. that is a difference of over 10 degrees.

Analysis and Results

My findings suggest that large bodies of water like Lake Erie have little to no effect on how

much temperature changes throughout a day. Although my data did show that when an area is very close to a large body of water like Lake Erie it tends to be warmer than areas further inland. Looking at my average temperature versus distance from Lake Erie graph we can see that on average when an area is very close to the shore of a large body of water like Lake Erie temperatures tend to be warmer throughout the day however as I moved further from the shore I noticed a less clear correlation between an area's distance from the shore and its average temperature throughout the day. I think I found these results because of the time of year and amount of trials that I completed. I think that if I were to do this experiment in the summertime where the days are much warmer and the sun is out. If I did this I think that I would find results that supported my hypothesis because the sun would be out throughout the day for a longer period of time allowing the lake to absorb more heat energy which would then be released in the night time. One area that may have caused a slight error in my project is that not all readings were taken at the exact same time but only within the same hour. One way I could have done this better is by setting up different weather stations at each area so I could get an accurate reading at the exact same time at each area. My results did accurately test my hypothesis but did not support it as there was not a clear change in weather patterns as an area got further from the shore of Lake Erie.

Conclusion

In conclusion my findings show that there is not a significant statistical difference between temperature patterns at different distances from Lake Erie. A study done by Zahra Jandaghian and Andrew Colombo in September of 2024 showed a strong correlation between temperature in relation to their distances from a body of water. Yet their data showed that in tropical areas, large bodies of water actually keep surrounding areas colder than inland areas during the day because they absorb the heat energy from the sun during the day and release it at night. My results somewhat surprised me as I never thought about how something as simple as a lake could affect temperatures even at the slight amount I found. My findings could help real world situations by explaining how during the winter time Lake Erie keeps surrounding areas slightly warmer. If this experiment were done in the summer I would predict that there would be a much more noticeable change in temperature patterns compared to an area's distance to the lake because the lake would have much more time in the sun during the day to absorb the sun's heat energy and release it during the night time. If I were to do this experiment again I would do it in the summertime because I would have much more available time to get more trials and the sun would shine on the Lake much more each day allowing the lake to absorb more heat energy and keep areas cooler during the day and much warmer at night I also might try to use a different body of water like an ocean but this would take lots of time so I don't know if it's quite realistic but I think I would find much different results. This project taught me a lot about the scientific method and how many trials are very important for the most accurate and reliable data. Something else I think would be interesting is to test the feels like temperatures close to the lake

versus far from the lake to see if that has an impact on temperatures as well.

References

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